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PRINCIPAL INVESTIGATOR: Richard N. Miller, M.D.

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Richard N. Miller, M.D.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
National Academy of Sciences
Washington, DC 20418

E-Mail: rmiller@nas.edu

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13. ABSTRACT (Maximum 200 Words)

Between 1990 and 1991, some 700,000 American military personnel were deployed to the Persian Gulf. Following the return of these troops home, many complained of ailments that could not be medically explained. Subsequently, the Department of Veterans Affairs and the Department of Defense created several registries to document and track illness associated with the PGW. The current study compares the pattern of health care seeking between registrants with multi-symptom illness and those considered well in the year prior to deployment. Cases were defined as those registrants assigned code diagnoses such as somatization disorder, myalgia and myositis unspecified, chronic fatigue syndrome, fibromyalgia, unexplained musculoskeletal and connective tissues problems, etc. Controls were defined as individuals with a code indicating "well" or "no complaint." Rates of those registrants with multi-symptom illness were compared to those defined as "well." Results were broken down by the type of registry (Persian Gulf Registry Old, Persian Gulf Registry New, and Comprehensive Clinical Evaluation Program) and the type of medical care visit (whether it was an elective visit or administrative visit). Odds rations and regression coefficients were calculated using logistic regression analyses, and adjusted for age, race, sex, marital status, and enlisted status. It is anticipated that the results of this study will be published in a peer-reviewed scientific journal.

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Introduction

Between 1990 and 1991, some 700,000 American military personnel were deployed to the Persian Gulf. Following the return of these troops home, many complained of ailments that could not be medically explained. Subsequently, the Department of Veterans Affairs and the Department of Defense created several registries to document and track illness associated with the Persian Gulf War (PGW). Public interest in this topic has spurred researchers to investigate the association between PGW participation and unexplained illness. The results of these studies have shown that registrants were more likely to have been hospitalized in the year before the war than were non-registrants (1). Another study found that during an average five year period prior to the war, registrants were 29% more likely to have been hospitalized (2). What has become clear during the years since establishment of the registries is that the majority of the registrant patients suffer from multi-symptom illness of unknown duration and that they attribute their illness to reported exposures during the PGW (3). This study tests the hypothesis that Army registrants reporting multisymptom illness have different patterns of health care seeking in the year prior to the GW than do Army registrants who were diagnosed as being in good health.

Background

Between 1990 and 1991, some 700,000 American military personnel were deployed to the Persian Gulf. Following the return of these troops home, many complained of ailments that could not be medically explained. Subsequently, the Department of Veterans Affairs and the Department of Defense created several registries to document and track illness associated with the Persian Gulf War (PGW). The results of these studies show that registrants utilize health care more frequently than controls before deployment. The current study tests the hypothesis that registrants reporting multisymptom illness have different patterns of health care seeking in the year prior to the GW than do registrants who were diagnosed as being in good health.

Materials and Methods

Individuals eligible for inclusion in the study population were those who entered active-duty Army service before August 1, 1989 and remained in active status until August 3, 1990 or later; were deployed to the Persian Gulf War for any time between August 2, 1990 and July 31, 1991; and left active-duty after their PGW service and before January 1, 1999. A total of 221,548 individuals were identified as eligible. These 221,598 eligibles were matched against the VA and DoD registry populations to define registrants, which numbered more than 49,000. We selected all registrant cases and controls, defined below, for inclusion in our study.

Cases were defined as either those registrants assigned a single code diagnosis such as somatization disorder, myalgia and myositis unspecified, chronic fatigue syndrome, or fibromyalgia, or registrants assigned multiple International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9 CM) symptom codes without an etiologic diagnosis in three or more categories such as musculoskeletal and connective tissues, mental disorders, fatigue, dermatologic, digestive

diseases, or diseases of the respiratory system (4). Controls were defined as individuals with a code indicating "well" or "no complaint."

The registries

The VA established the Registry Health Examination Program in 1992, referred to as the Persian Gulf War Registry Old (PGRO), which provided medical examination (history, physical, and screening laboratory tests) to any Gulf War veteran with health concerns. Symptoms and diagnoses were coded according to the ICD-9 CM (6) in this and the subsequent VA and DoD registries. The VA registry was modified in 1995 as the Persian Gulf War Registry New (PGRN), expanding the number of possible coded diagnoses and coded symptoms from three to ten. Certain additional codes for fibromyalgia and chronic fatigue syndrome were added. The DoD established a similar evaluation program called the Comprehensive Clinical Evaluation Program (CCEP) in 1994. The data are sufficiently different in the three registries that separate analyses are necessary.

Obtaining medical record data

The study population was defined as PGW Army veterans who were on active duty for a year prior to the war because the Service Medical Record (SMR) for active duty personnel records relevant health information other than inpatient admissions. All outpatient encounters, even for events such as required immunizations or required weight determinations are recorded. Records on military personnel who have left active duty are in the custody of the VA. The most common site for the SMR is within a claim folder at a VA regional office. A minority of records were obtained that were not part of the claims process. Records were requested to be sent to a single VA location where all outpatient encounters during the year prior to the PGW were copied. The encounters were then coded by one of us (DC), an Army physician experienced in the creation and use of the SMR. Visits were counted and

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coded according to a system employed by investigators documenting morbidity and health care seeking in female soldiers (5).

Defining visit types

Presence or absence of any visit during the one-year time period prior to the Gulf War, as well as number of visits, was analyzed. In addition, three specific types of visits (non-elective, intermediate, and elective) were defined a priori by the study staff. Non-elective visits were based on a modified definition used by Gunzenhauser et al. (5) and included the codes for shots, immunization, and tuberculin skin testing; hearing test/audiogram; evaluation/fitting of ear plugs; physical exam/Health Risk Appraisal class; flight status determination/flight physical; in-processing; fractures; stress fracture; dislocation; sutures; incision and drainage; excision of cyst; and foreign body removal. An elective visit was defined by any of the following diagnoses: chills; flu-like illness without documented fever; low back pain; costochondritis; headache; dizziness; chest pain; tinnitus; vertigo; neuralgia; and all psychiatric conditions including acute stress/anxiety, depression, panic disorder, and miscellaneous psychiatric diagnoses. Intermediate visits were defined as any visit not categorized as elective or non-elective; therefore, the total number of visits for a particular veteran was equal to the sum of the non-elective, intermediate, and elective visits. Analyses were performed examining each of the visit types as a dichotomous variable (yes/no for each visit type).

<u>Demographics</u>

TABLE 1. Demographic characteristics for entire study population

	CCEP Case (n=2182)	CCEP Control (n=1424)	PGRO Case (n=1170)	PGRO Control (n=1175)	PGRN Case (n=2025)	PGRN Control (n=426)
Mean age in 1991	31.4	31.1	28.5	27.9	28.3	28.6
% Male	89%	92%	90%	92%	91%	92%
%Enlisted	94%	91%	96%	94%	96%	92%
Mean length of service (years)	10.8	10.9	8.0	7.4	8.0	8.3
% Married	74%	72%	60%	48%	58%	55%
% with GED	4.5%	3.3%	6.2%	4.4%	7.6%	2.8%
Race/ethnicity						
White	51%	49%	61%	62%	59%	61%
Black	37%	43%	26%	29%	31%	31%
Hispanic	6%	4%	7%	5%	5%	4%
Other	6%	4%	6%	4%	5%	4%

Analysis and Reporting

Means and frequency distributions of demographic and service variables were examined. Visit rates of those registrants with multi-symptom illness, categorized as cases, were compared to controls, otherwise knows as those defined as "well." Results were broken down by the type of registry (Persian Gulf Registry Old, Persian Gulf Registry New, and Comprehensive Clinical Evaluation Program) and the type of medical care visit (whether it was an elective visit or administrative visit), including the

number of non-elective and elective visits categorized as 0 visits, 1 visit, and ≥ 2 visits. Odds ratios and regression coefficients were calculated within each registry grouping using multivariate logistic regression analyses, and adjusted for age, race, sex, marital status, and enlisted status. Multiple linear regression models were used to analyze the number and type of visits within each registry group. It is anticipated that the results of this study will be published in a peer-reviewed scientific journal.

Key Research Accomplishments

During this study, the following key research accomplishments were achieved:

- the case cohort and control cohort were selected;

- service medical records, including outpatient data, for both cohorts were obtained from the VA;

- records for all visits were assigned ICD-9 codes and were aggregated into 12 categories such as depression, anxiety, hysteria/hypochondriasis/psychogenic symptoms, etc.

- the data were analyzed, conclusions drawn, and a final report was prepared for publication in a peer-reviewed journal

Reportable Outcomes

A preliminary analysis of these data was presented at the Department of Defense sponsored 6th Annual Force Health Protection Conference, Albuquerque, New Mexico, 11-17 August, 2003. Final results from this study will be published in a peer-review journal.

Conclusions

Final results from this study will be published in a peer-review journal. The results will be of interest to researchers, government agencies, and participants in the Persian Gulf War. Copies of the final report will be provided to the Army when it is available.

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(3) Fukuda K, Nisenbaum R, Stewart G, Thompson WW, Robin L, Washko RM, Noah DL, Barrett DH, Randall B, Herwaldt BL, Mawle AC, and Reeves WD. Chronic multi-symptom illness affecting Air Force Veterans of the Gulf War. JAMA 1998 Sep 16; 280(11): 981-8.

(4) Barrett DH, Doebbeling CC, Schwartz DA, Voelker MD, Falter KH, Woolson RF, Doebbeling BN. Posttraumatic stress disorder and self-reported physical health status among U.S. Military personnel serving during the Gulf War period: a population-based study. Psychosomatics. 2002 May-Jun; 43(3):195-205.

(5) Gunzenhauser JD and Pavlin JA. Comparative Morbidity Study of Active Duty Women Serving in Korea and Ft. Lewis. Unpublished.

(6) Miller RN, Costigan DJ, Young HA, Kang HK, Dalager N, Mathes R, Crawford H, Page WF, Thaul S. Patterns of Health Care Seeking of Persian Gulf War Registry Members prior to Deployment. Presented at the Department of Defense sponsored 6th Annual Force Health Protection Conference, Albuquerque, New Mexico, 11-17 August, 2003.

Briefing Slides – 6th Annual Force Health Protection
Conference, Albuquerque, New Mexico (11-17
August 2003)

Patterns of Health Care Seeking
of Persian Gulf War Registry Members
Prior to Deployment

Daniel J. Costigan, DO, MPH

Major, Medical Corps

WRAIR Preventive Medicine Resident

STUDY AUTHORS

- **Richard N. Miller[1], Daniel J. Costigan[2], Heather A. Young[3], Han K. Kang[4], Nancy Dalager[4], Robert Mathes[1], Harriet Crawford[1], William F. Page[1], Susan Thaul[5]**

[1] Medical Follow-up Agency, Institute of Medicine, the National Academies, Washington, DC.

[2] Division of Preventive Medicine, Walter Reed Army Institute of Research, Washington, DC

[3] Department of Epidemiology & Biostatistics, George Washington University, Washington, DC

[4] Environmental Epidemiology Service, Department of Veterans Affairs, Washington, DC

[5] Congressional Research Service, Library of Congress, Washington, DC

BACKGROUND

- In February 1992, a noncommissioned officer of the 300th Supply and Service battalion initiated a survey that elicited general complaints

- This information came to the attention of the Command Surgeon and an Epidemiology Consultant Service was requested through the Office of the Surgeon General

- 125 veterans assigned to the 123rd Army Reserve Command reported a wide variety of non specific symptoms and 79 were evaluated by the EPICON team[1]

[1] Defraites, et al. Investigation of suspected outbreak of an unknown disease among veterans....Walter Reed Army Ins. Research, 1992.

BACKGROUND

- Department of Defense established programs and registries for evaluation and documentation of PGW related illness

- Large numbers of soldiers complained of illness attributed to exposure during deployment

- The Institute of Medicine's Medical Follow-up Agency was funded for a study to look into the health care seeking patterns of soldiers prior to the war

METHODS

- Hypothesis: registrants with multisymptom illness after the war had different health care seeking patterns prior to the war compared to well registrants

- A case-control design was utilized to compare the health care seeking patterns in the 12 months prior to deployment

- Analysis will include logistic regression and multiple linear regression models

CASE DEFINITION

- Those registrants assigned Veterans Administration codes that include somatization disorder, myositis, chronic fatigue, or fibromyalgia

- And those registrants assigned multiple symptom codes with unknown etiology in three or more categories

- Controls are those soldiers with a code indicating well or no complaint

STUDY POPULATION

```
697,000 American Military Deployed to Persian Gulf War
                          │
                          ▼
              Time & Service Eligibility Criteria
                          │
                          ▼
                      221548
                          │
         Registrants = 49,316 ──────────────────────────┐
                          │                              │
    ┌─────────────┬───────┴────────┐                     ▼
    ▼             ▼                ▼              NonRegistrants
  PGRO          PGRN             CCEP              172,232
  16463         11512            21341                │
    │             │                │                  ▼
  ┌─┴──┐       ┌──┴──┐          ┌──┴───┐            Sample
  ▼    ▼       ▼     ▼          ▼      ▼            1,795
 Case Control Case Control    Case   Control          │
1,170 1,175  2,025  426      2,182   1,424            ▼
  │    │       │     │          │      │             985
  ▼    ▼       ▼     ▼          ▼      ▼            (55%)
 803   688   1,337   277      1,587   987
(69%) (58%)  (66%)  (65%)     (73%)  (69%)

                                            SMR's
                                          (Obtained)
```
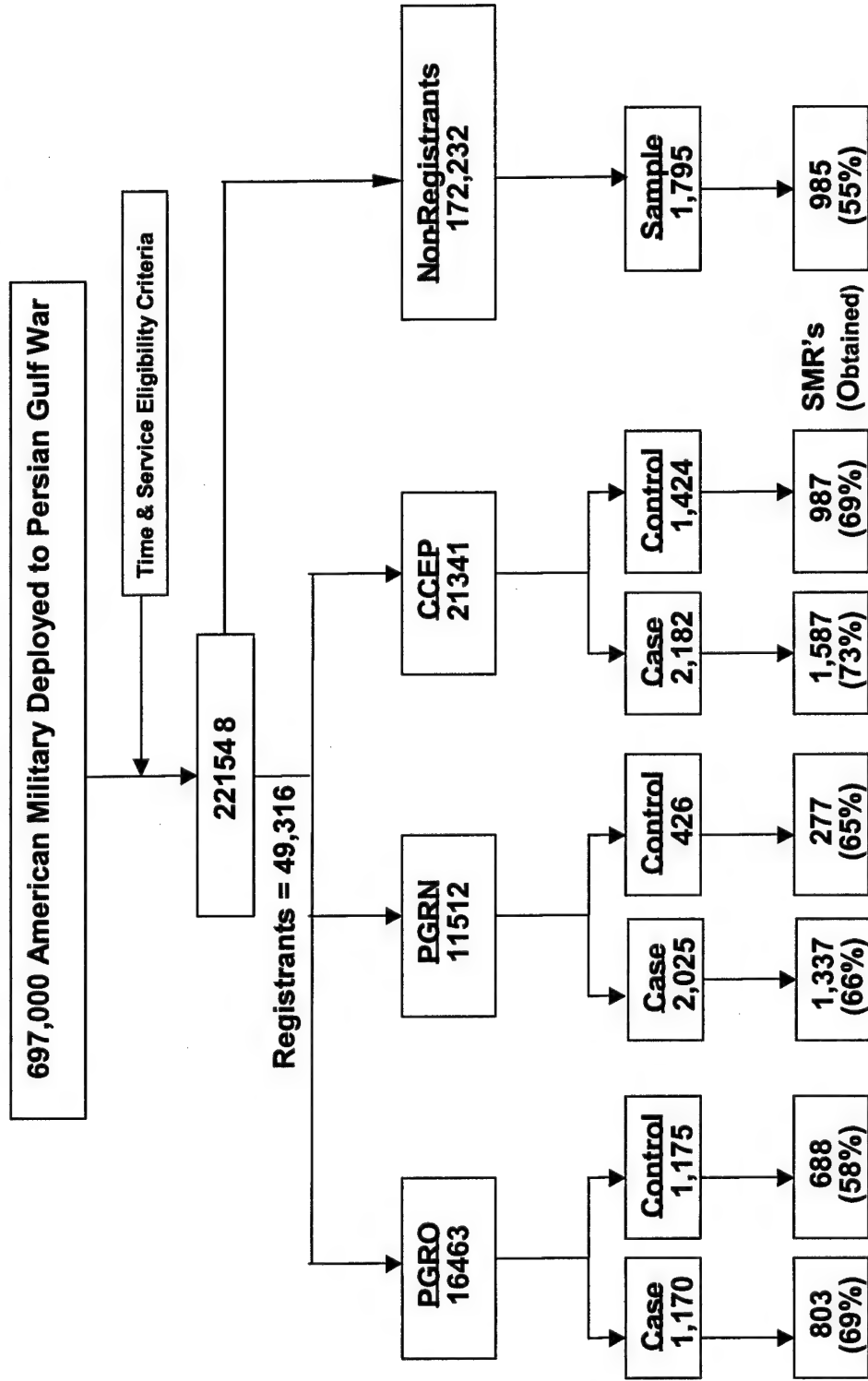
Table 1. Demographic Characteristics for Entire Study Population

	CCEP Case n=2182	CCEP Control n=1424	PGRO Case n=1170	PGRO Control n=1175	PGRN Case n=2025	PGRN Control n=426
Mean age in 1991	31.4	31.1	28.5	27.9	28.3	28.6
% Male	89%	92%	90%	92%	91%	92%
%Enlisted	94%	91%	96%	94%	96%	92%
Mean length of service (years)	10.8	10.9	8.0	7.4	8.0	8.3
% Married	74%	72%	60%	48%	58%	55%
% with GED	4.5%	3.3%	6.2%	4.4%	7.6%	2.8%
Race/ethnicity						
White	51%	49%	61%	62%	59%	61%
Black	37%	43%	26%	29%	31%	31%
Hispanic	6%	4%	7%	5%	5%	4%
Other	6%	4%	6%	4%	5%	4%

Table 2. Demographic Characteristics for Soldiers with Service Medical Record (SMR) Available

	CCEP Case n=1587	CCEP Control n=987	PGRO Case n=803	PGRO Control n=688	PGRN Case n=1337	PGRN Control n=277
Mean age in 1991	31.5	31.4	28.9	28.6	28.7	29.6
% Male	89%	93%	91%	90%	90%	92%
%Enlisted	93%	91%	96%	92%	95%	90%
Mean length of service (years)	11.1	11.3	8.4	8.2	8.4	9.1
% Married	74%	72%	63%	52%	59%	61%
% with GED	4.4%	4.1%	6.2%	4.5%	8.2%	3.3%
Race/ethnicity						
White	51%	48%	61%	60%	60%	56%
Black	36%	44%	26%	32%	30%	35%
Hispanic	7%	4%	8%	5%	5%	4%
Other	8%	4%	5%	3%	5%	5%

DATA COLLECTION

- The VA copied each medical record and sent them to the Institute of Medicine

- Outpatient encounters coded included both non-elective, intermediate, and elective visits

- Visits were coded using common visit categories.[2]

2 Gunzenhauser JD, Pavlin JA Comparative Morbidity Study of Active Duty women, USAMRIID.

RESULTS BY VISIT TYPE

Table 3. Crude and Adjusted Odds Ratios and 95% CI Comparing Each Case Group to Comparable Control Group

	CCEP		PGRO		PGRN	
	Crude OR (95% CI)	Adjusted OR* (95% CI)	Crude OR (95% CI)	Adjusted OR* (95% CI)	Crude OR (95% CI)	Adjusted OR* (95% CI)
Any visit	1.19 (0.98-1.44)	1.16 (0.96-1.41)	1.37 (1.04-1.82)	1.28 (0.96-1.71)	1.17 (0.83-1.64)	1.13 (0.80-1.60)
Non-elective visit	0.98 (0.82-1.19)	0.99 (0.82-1.19)	1.30 (1.04-1.63)	1.29 (1.02-1.62)	0.86 (0.65-1.15)	0.85 (0.64-1.14)
Intermediate visit	1.20 (1.00-1.44)	1.19 (0.99-1.43(	1.31 (1.00-1.72)	1.24 (0.94-1.63)	1.12 (0.81-1.56)	1.10 (0.79-1.53)
Elective visit	1.58 (1.26-1.99)	1.56 (1.24-1.97)	1.53 (1.20-1.95)	1.45 (1.12-1.86)	2.14 (1.46-3.13)	2.11 (1.44-3.10)

*adjusted for age in 1991, race/ethnicity, sex, marital status, and military rank

RESULTS BY VISIT FREQUENCY

Table 4. Adjusted Odds Ratios and 95% CI Comparing Case Group to Control Group
(included only those with at least one visit of any type)

Registry Group	Visit Type	Frequency of visits	# of cases (%)	# of controls (%)	Adjusted OR* (95% CI)
CCEP	Non-elective	0	863 (62.8%)	512 (37.2%)	1.0
		1	291 (65.0%)	157 (35.0%)	1.11 (0.88-1.39)
		2+	109 (53.7%)	94 (46.3%)	0.67 (0.49-1.01)
	Intermediate	0-1	236 (54.6%)	196 (45.4%)	1.0
		2-4	515 (62.0%)	316 (38.0%)	1.39 (1.09-1.76)
		5+	511 (67.1%)	250 (32.9%)	1.65 (1.29-2.12)
	Elective	0	978 (60.3%)	643 (39.7%)	1.0
		1	171 (68.7%)	78 (31.3%)	1.40 (1.05-1.87)
		2+	114 (73.1%)	42 (26.9%)	1.67 (1.16-2.45)

*age in 1991, race/ethnicity, sex, marital status, military rank, and other visit types

RESULTS BY VISIT FREQUENCY

Table 6. Adjusted Odds Ratios and 95% CI Comparing Case Group to Control Group
(included only those with at least one visit of any type)

Registry Group	Visit Type	Frequency of visits	# of cases (%)	# of controls (%)	Adjusted OR* (95% CI)
PGRN	Non-elective	0	789 (84.2%)	148 (15.8%)	1.0
		1	237 (80.9%)	56 (19.1%)	0.80 (0.56-1.13)
		2+	97 (62.2%)	59 (37.8%)	0.77 (0.47-1.24)
	Intermediate	0-1	187 (79.2%)	49 (20.8%)	1.0
		2-4	446 (81.8%)	99 (18.2%)	1.08 (0.73-1.60)
		5+	507 (86.2%)	81 (13.8%)	1.39 (0.92-2.10)
	Elective	0	832 (81.0%)	195 (19.0%)	1.0
		1	174 (87.4%)	25 (12.6%)	1.61 (1.02-2.53)
		2+	134 (93.7%)	9 (6.3%)	3.24 (1.61-6.52)

*age in 1991, race/ethnicity, sex, marital status, military rank, and other visit types

RESULTS BY VISIT FREQUENCY

Table 5. Adjusted Odds Ratios and 95% CI Comparing Case Group to Control Group
(included only those with at least one visit of any type)

Registry Group	Visit Type	Frequency of visits	# of cases (%)	# of controls (%)	Adjusted OR* (95% CI)
PGRO	Non-elective	0	443 (53.3%)	389 (46.8%)	1.0
		1	162 (58.1%)	117 (41.9%)	1.23 (0.92-1.63)
		2+	93 (59.2%)	64 (40.8%)	1.26 (0.88-1.79)
	Intermediate	0-1	97 (47.8%)	106 (52.2%)	1.0
		2-4	246 (52.0%)	227 (48.0%)	1.23 (0.88-1.73)
		5+	354 (60.0%)	236 (40.0%)	1.60 (1.15-2.24)
	Elective	0	484 (52.5%)	438 (47.5%)	1.0
		1	117 (61.6%)	73 (38.4%)	1.35 (0.97-1.87)
		2+	97 (62.2%)	59 (37.8%)	1.41 (0.98-2.02)

*age in 1991, race/ethnicity, sex, marital status, military rank, and other visit types

ADDITIONAL RESULTS

- CCEP cases have lower odds of being male or black and higher odds of being enlisted or Hispanic

- PGRO cases have lower odds of being black and higher odds of being married and enlisted

- PGRN cases have higher odds of being enlisted

Table 7. Multiple Regression Coefficients for Visit Types by Registry Group

	Non-Elective			Intermediate			Elective		
	CCEP	PGRO	PGRN	CCEP	PGRO	PGRN	CCEP	PGRO	PGRN
Case status (Case=1; Control=0)	-0.03	0.04	-0.02	0.71*	0.89*	0.74*	0.15*	0.23*	0.25*
Age in 1991	-0.004	-0.006	-0.009	-0.001	-0.03	-0.05	0.008	0.005	-0.001
Marital status (Married=1; Non-married=0)	0.02	0.03	-0.04	-0.23	-0.52	-0.17	-0.05	0.13	0.11
Military rank (Enlisted=1;Warrant/Officer=0)	-0.27*	0.13	-0.06	0.59	1.58*	1.00*	0.07	0.23	0.14
Sex (Male=1; Female=0)	-0.03	-0.15	-0.18*	-2.26*	-3.38*	-2.20*	-0.15*	-0.46*	-0.15
Race Black	-0.08*	-0.13	-0.11*	-0.65	-0.50	0.09	0.01	-0.04	0.02
Hispanic	-0.14	-0.12	-0.14	-0.53	0.72	-0.65	-0.07	-0.07	-0.19
Other	0.01	-0.03	-0.17	-0.24	0.27	-0.65	0.08	-0.08	0.07

*significant at $p<0.05$

Table 8. ADJUSTED MEANS*, DIFFERENCES BETWEEN CASES AND CONTROLS BY VISIT TYPE

		Adjusted mean*		Difference (Cases-Controls)	95% CI
		Cases	Controls		
CCEP	Non-elective visit	0.337	0.343	-0.004	-0.07, 0.05
	Intermediate	3.22	2.48	0.74	0.44, 1.04
	Elective visit	0.32	0.15	0.17	0.11, 0.23
PGRO	Non-elective visit	0.42	0.38	0.04	-0.08, 0.17
	Intermediate	5.51	4.40	1.11	0.65, 1.57
	Elective visit	0.57	0.34	0.23	0.10, 0.35
PGRN	Non-elective visit	0.30	0.36	-0.06	-0.17, 0.06
	Intermediate	2.86	2.38	0.48	-0.07, 1.03
	Elective visit	0.29	0.12	0.17	0.06, 0.29

*adjusted for case status, age in 1991, race/ethnicity, sex, marital status, and military rank

SECONDARY ANALYSIS

- Sex is a significant predictor for numbers of each type of visit

- In this study each each registry was studied separately so we performed a case control analysis regardless of registry group

DISCUSSION

- Registry veterans who were cases had higher rates of pre-deployment health care than controls

- These higher rates were concentrated in elective visits rather than non-elective

- The odds ratios are not large with cases perhaps twice as high as controls

DISCUSSION

- The odds ratios in table 6 can be used to answer how good a predictor of casesness are the numbers and types of visits

- Are the cases incident or prevalent?

LIMITATIONS

- 75% of the SMRs retrieved for cases and 65% retrieved for the controls

- 68% of the registrants records were retrieved and only 55% of the nonregistrants records were located

- Little can be said with confidence about non-registrants' health care seeking behavior

FUTURE RESEARCH

- Defense Medical Surveillance System (DMSS) data might reduce the resulting delay and bias introduced by abstracting data from SMRs

- The results of this study justify additional study without the limitations encountered here

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QUESTIONS